

WHAT IS CLAIMED IS:

1. A bone fixation assembly comprising:

a coupling element having a first bore coaxial with a first longitudinal axis and a second bore coaxial with a second longitudinal axis, wherein said first and second longitudinal axes are transverse to one another; and

an anchoring element assembled with said coupling element, said anchoring element having a first end for insertion into bone.

2. The assembly of claim 1, wherein said coupling element has an upper end and a lower end, said first bore extending from said upper end toward said lower end and said second bore extending from said lower end toward said upper end.

3. The assembly of claim 2, wherein said first and second bores are in communication with one another between said upper and lower ends of said coupling element.

4. The assembly of claim 2, wherein said upper end of said coupling element defines a first plane and said lower end of said coupling element defines a second plane, and wherein said first and second planes intersect one another.

5. The assembly of claim 2, wherein said anchoring element projects from said lower end of said coupling element.

6. The assembly of claim 1, wherein said anchoring element is a separate member assembled with said coupling element so that said coupling element and said anchoring element are movable relative to one another.

7. The assembly of claim 2, wherein said second bore includes a seat adjacent said lower end of said

coupling element, and wherein said seat is adapted to engage said anchoring element.

8. The assembly of claim 7, wherein said anchoring element has a head having a substantially spherical underside adapted to engage said seat.

9. The assembly of claim 8, wherein said seat is shaped for facilitating pivotal movement of said coupling element and said anchoring element relative to one another.

10. The assembly of claim 9, wherein said seat is substantially conical with sidewalls tapering inwardly toward said lower end of said coupling element.

11. The assembly of claim 9, wherein said seat has a substantially concave surface adapted to engage the spherical underside of said head.

12. The assembly of claim 1, further comprising a locking element engageable with said coupling element for securing a stabilizing rod within said coupling element.

13. The assembly of claim 8, wherein said anchoring element includes a neck adjacent said head having a diameter less than the diameter of said threaded portion for facilitating pivotal movement of said coupling element and said anchoring element relative to one another.

14. The assembly of claim 13, wherein said neck includes a concave surface.

15. The assembly of claim 8, further comprising a locking element engageable with said coupling element for locking the position of said coupling element with respect to said anchoring element.

16. The assembly of claim 15, wherein said locking element urges a stabilizing rod toward said lower end of said coupling element which in turn forces said head of

said anchoring element against said seat for locking said coupling element and said anchoring element from further movement relative to one another.

17. The assembly of claim 16, wherein said seat is defined by an interior wall of said coupling element.

18. The assembly of claim 1, wherein said coupling element has an exterior surface, an upper end and a lower end, said rod-receiving openings extending from said upper end toward said lower end, and wherein said coupling element comprises cuts between said exterior surface and said rod-receiving openings for minimizing the width of said coupling element.

19. The assembly of claim 1, wherein said anchoring element comprises a hook or barbs for engaging bone.

20. The assembly as claimed in claim 1, wherein said anchoring element is a screw fastener having screw threads extending from said first end toward a second end thereof.

21. The assembly of claim 7, wherein said coupling element includes a chamfer adjacent said first bore for facilitating assembly of said anchoring element with said coupling element.

22. A bone fixation assembly comprising:

a coupling element having an upper end defining a first plane, a lower end defining a second plane, and at least one bore extending from said upper end toward said lower end, wherein said first and second planes intersect one another; and

an anchoring element assembled with said coupling element, said anchoring element being adapted for insertion into bone.

23. The assembly of claim 22, wherein said coupling element includes at least one bore extending between said

upper end and said lower end for receiving said anchoring element.

24. The assembly of claim 22, wherein said coupling element has a seat shaped to allow said coupling element to pivot with respect to said anchoring element.

25. The assembly of claim 24, wherein said anchoring element has a head with a substantially spherical shape and said coupling element has a conical-shaped seat adjacent said lower end thereof, and wherein said spherical head is adapted to engage said conical seat.

26. The assembly of claim 25, wherein said head has at least one depression adapted to receive a driver for driving said anchoring element into bone.

27. The assembly of claim 25, wherein said anchoring element includes a reduced diameter neck for facilitating pivotal movement of said coupling element with respect to said anchoring element.

28. A coupling element having an upper end and a lower end comprising:

a first section extending from said upper end toward said lower end of said coupling element, said first section including a first bore coaxial with a first longitudinal axis;

a second section extending from said lower end toward said upper end of said coupling element, said second section having a second bore coaxial with a second longitudinal axis that intersects said first longitudinal axis; and

rod receiving openings extending between said upper and lower ends of said coupling element and being adapted to receive an orthopedic rod.

29. The coupling element of claim 28, wherein said second bore includes a seat adjacent said lower end of said coupling element.

30. The coupling element of claim 29, wherein said seat is adapted to engage a head of an anchoring element secured with said coupling element so that said coupling element and said anchoring element are pivotable relative to one another.

31. The coupling element of claim 30, wherein said seat is adapted to engage an underside of said head of said anchoring element.

32. The coupling element of claim 28, wherein said seat has an inwardly tapering conical shape or a convex shape.

33. The coupling element of claim 30, wherein said coupling element includes an inner surface defining said first and second bores, said rod receiving openings being defined by substantially U-shaped opening surfaces, and further comprising a chamfer extending from one of said opening surfaces to said inner surface.

34. The coupling element of claim 30, wherein said inner surface includes threads adjacent said upper end thereof for engaging a locking element for securing an orthopedic rod within said rod receiving openings of said coupling element.

35. The coupling element of claim 34, wherein said locking element has external threads adapted for threading into said internal threads of said coupling element.

36. The coupling element of claim 28, wherein said coupling element has an outer surface with notches for engagement by an instrument for positioning said coupling element with respect to an orthopedic rod.

37. A coupling element for a bone fixation assembly comprising:

an upper end defining a first plane;

a lower end defining a second plane;

at least one bore extending between said upper end and said lower end, said at least one bore being adapted to receive an anchoring element, wherein said first plane and said second plane intersect one another.

38. The coupling element of claim 37, wherein said first and second intersecting planes define an angle of about 20-30°.

39. The coupling element of claim 37, wherein said first and second intersecting planes define an angle of about $25^{\circ} \pm 2^{\circ}$.

40. The coupling element of claim 37, wherein said first and second intersecting planes define an angle of about 24°.

41. The coupling element as claimed in claim 37, wherein said coupling element has a first bore extending from said upper end toward said lower end and a second bore extending from said lower end toward said upper end, and wherein said first and second bores are angled relative to one another.

42. A coupling element for a pedicle screw assembly, comprising:

a first section at an upper end of said coupling element, said first section having a first bore extending therethrough coaxial with a first longitudinal axis;

a second section at a lower end of said coupling element, said second section having a second bore extending therethrough coaxial with a second longitudinal

axis, wherein said first and second longitudinal axes intersect one another.

43. The coupling element of claim 42, wherein said first and second longitudinal axes intersect one another at an angle of between about 20-30°.

44. A method of stabilizing an area of the spine of a patient comprising:

providing a coupling element having first and second sections that are angled relative to one another, said coupling element having rod receiving openings for securing an orthopedic rod;

assembling said coupling element with an anchoring element;

after the assembling step, securing said anchoring element in bone;

moving said coupling element relative to said anchoring element to align said rod receiving openings with said orthopedic rod;

securing said orthopedic rod in said rod receiving openings; and

after the securing step, locking said coupling element from further movement relative to said anchoring element.

45. The method of claim 44, wherein said coupling element has a first bore extending through said first section and a second bore extending through said second section.

46. The method of claim 44, wherein said rod receiving openings extend through said first section of said coupling element in a direction transverse to said first bore.

47. The method of claim 45, wherein said first and second bores intersect one another between said upper and lower ends of said coupling element.

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